Chapter 34. Effect of Nurse-to-Patient Staffing Ratios on Patient Morbidity and Mortality

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How Important Is the Problem?

A small percentage of hospitalized patients die during or shortly after their hospitalization. Evidence suggests that some proportion of these deaths could probably have been prevented with more nursing care. For example, in one early study of 232,342 surgical discharges from several Pennsylvania hospitals, 4,535 patients (2%) died within 30 days of the hospital admission; the investigators estimated that the difference between 4:1 and 8:1 nurse-to-patient staffing ratios might be approximately 1,000 deaths.[1] Other studies have resulted in roughly similar estimates, namely about 1 to 5 fewer deaths per 1000 inpatient days.

What Is the Patient Safety Practice?

What the patient safety practice "is" remains unclear, because to date no intervention studies have assessed the effect of a deliberate change in registered nurse (RN)–to–patient staffing ratios. Most studies have been cross-sectional or longitudinal assessments of differences in nursing staff variables (see below), with the most commonly assessed measure being the proportion of RN time per a measure of inpatient load and the most commonly assessed outcome being mortality. However, numerous other factors have been proposed as being causal with respect to the relationship between nursing care and reductions in hospital mortality, potentially in addition to or instead of a simple nursing staff- to- patient ratio: These factors include measures of nursing burnout, job satisfaction, teamwork, nurse turnover, nursing leadership in hospitals, and nurse practice environment.

Why Should This Patient Safety Practice Work?

Conceptual frameworks for why more effective nursing care may reduce inpatient mortality have been proposed by Tourangeau and colleagues,[2] Thornlow, Anderson and Oddone ,[3] and Despins, Scott-Cawiezell, and Rouder.[4] Underlying all these conceptual frameworks is the belief that surveillance is a critical factor that can be improved with more staff, better educated staff, or a better working environment.[5] As shown by Aiken and colleagues,[6] nurse-patient ratios, along with staffing skill mix, can lead to better surveillance, which along with a number of other factors can influence the process of care and lead to better patient outcomes (see Figure 1).

Figure 1, Chapter 34. Hospital organization, nursing organization, and patient outcomes

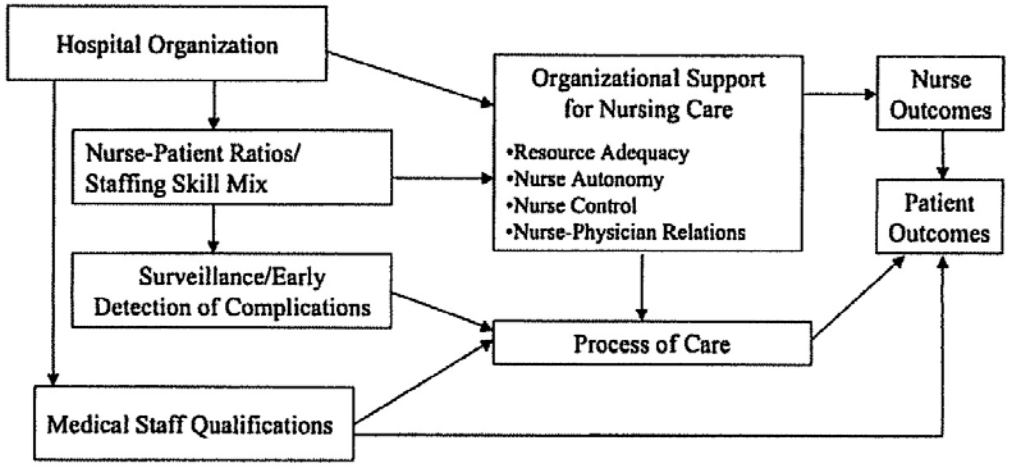


Figure taken from Aiken et al., 2002[6]
Aiken LH, Clarke SP, Sloane DM. Hospital staffing, organization, and quality of care: Cross-national findings. Nurs Outlook. 2002 Sep-Oct;50(5):187-94.with permission from Elsevier.

The model of Despins and colleagues (Figure 2) explicitly posits that better detection of potential signals of patients at risk of poor outcomes is the mechanism by which more effective nursing care exerts its beneficial effects; it further elaborates that organizational culture is an important component of better signal detection (e.g., high reliability organizations instill in their staff the value they place on safety). 'Internal factors' such as nurse fatigue also play a role in this model.

Figure 2, Chapter 34. Despins' model on patient risk detection

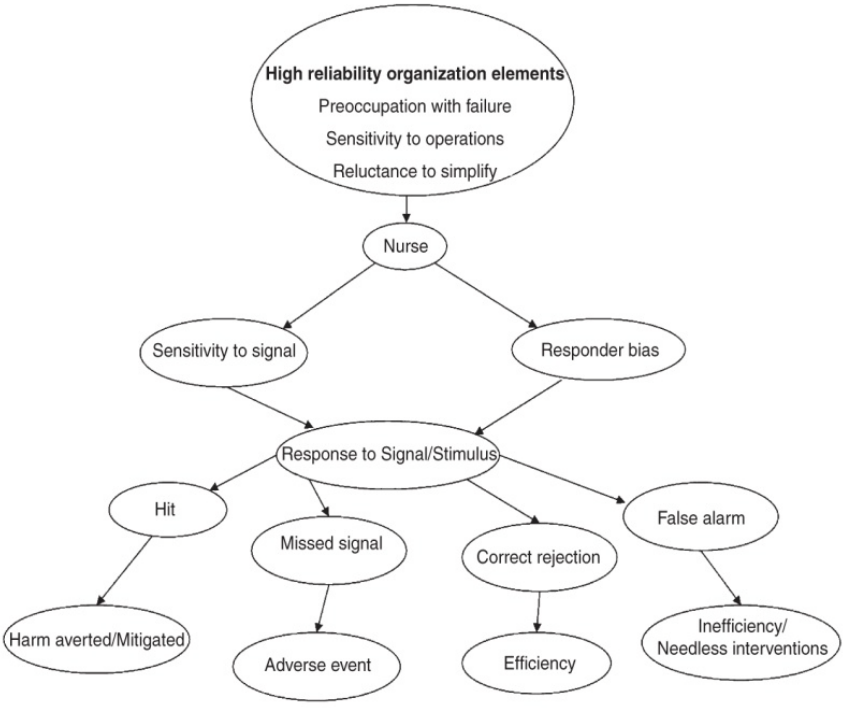


Figure taken from Despins et al., 2010[4]
Despins LA, Scott-Cawiezell J, Rouder JN. Detection of patient risk by nurses: a theoretical framework. Journal of Advanced Nursing. 2010. Permission granted by John Wiley & Sons, Inc.

In the models proposed by Tourangeau (Figure 3) and by Thornlow (Figure 4), numerous patient, system, nurse, nurse environment, and other factors are hypothesized to play an important role in reducing inpatient mortality and other outcomes. The Tournageau model explicitly posits that the use of 'care maps/protocols' is associated with lowering the risk of inpatient mortality.

Figure 3, Chapter 34. Tourangeau's model on determinants of 30-day mortality

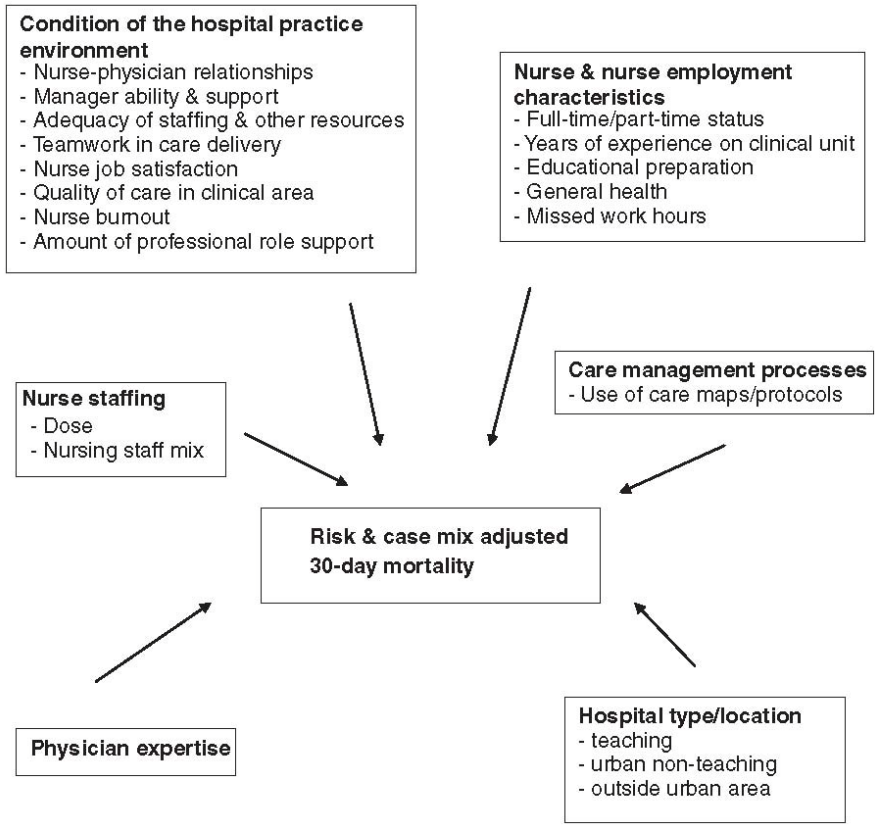
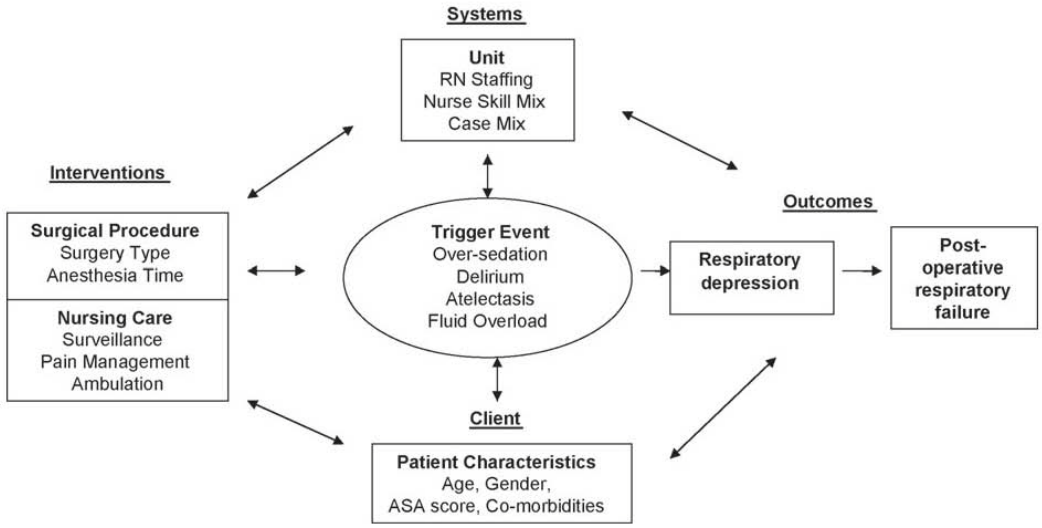


Figure taken from Tourangeau et al., 2006[2]
Tourangeau AE, Doran DM, Hall LM, et al. Impact of hospital nursing care on 30-day mortality for acute medical patients. Journal of Advanced Nursing. 2006. Permission granted by John Wiley & Sons, Inc.

Figure 4, Chapter 34. Thornlow's model on cascade iatrogenesis: postoperative respiratory failure



Notes: RN Registered Nurse; ASA American Society of Anesthesiologists
Figure taken from Thornlow et al., 20093
Reprinted from International Journal of Nursing Studies. 46(11), Thornlow DK, Anderson R, Oddone E. Cascade iatrogenesis: Factors leading to the development of adverse events in hospitalized older adults. 1528-35, 2009 with permission from Elsevier.

What Are the Beneficial Effects of the Patient Safety Practice?

Prior Studies and Reviews

Nurse staffing ratio is the most commonly assessed PSP in this category of practices and will be the focus of this review. This portion of the review relied primarily on systematic reviews by Kane and colleagues at the Minnesota Evidence-Based Practice Center[7] (EPC) and by Tourangeau;[8] they scored 10 out of 10 relevant and 7 out of 9 relevant, respectively, on the AMSTAR criteria. We supplemented these sources with an update search (described below). For their review, the Minnesota EPC performed a thorough literature search through 2006 and assessed the relationship between RN staffing ratios and the outcomes of inpatient mortality and adverse patient events such as hospital-acquired pneumonia, failure to rescue, and surgical wound infection. The review included 28 studies, of which 17 were cohort studies, 7 were cross-sectional studies, and 4 were case-control studies (i.e., no experimental studies were identified). Most were U.S. studies, and the average level of staffing was 3.0 patients per RN for the intensive care unit (ICU) setting, 4.0 patients per RN in the surgical setting, and 4.4 patients per RN for the medical setting. This review found a consistent association between higher RN staffing and lower hospital-related mortality: An increase of one RN full-time equivalent (FTE) per patient day was associated with a 9 percent reduction in the odds of death in the ICU, a 16 percent reduction in the odds of death in the surgical setting, and a 6 percent reduction in the odds of death in the medical setting (see Table 1). The numbers of avoidable deaths per 1,000 patient days were, respectively, 5, 6, and 5. With respect to other outcomes, lower rates of hospital-acquired pneumonia, pulmonary failure, unplanned extubation, failure to rescue, and nosocomial bloodstream infections were associated with higher RN staffing in pooled analyses of multiple studies. However, several other outcomes presumed to have strong sensitivity to nurse staffing levels did not show consistent associations; these outcomes included falls, pressure ulcers, and urinary tract infections.

Table 1, Chapter 34. Pooled odds ratios of patient outcomes corresponding to an increase of one registered nurse full-time equivalent per patient day

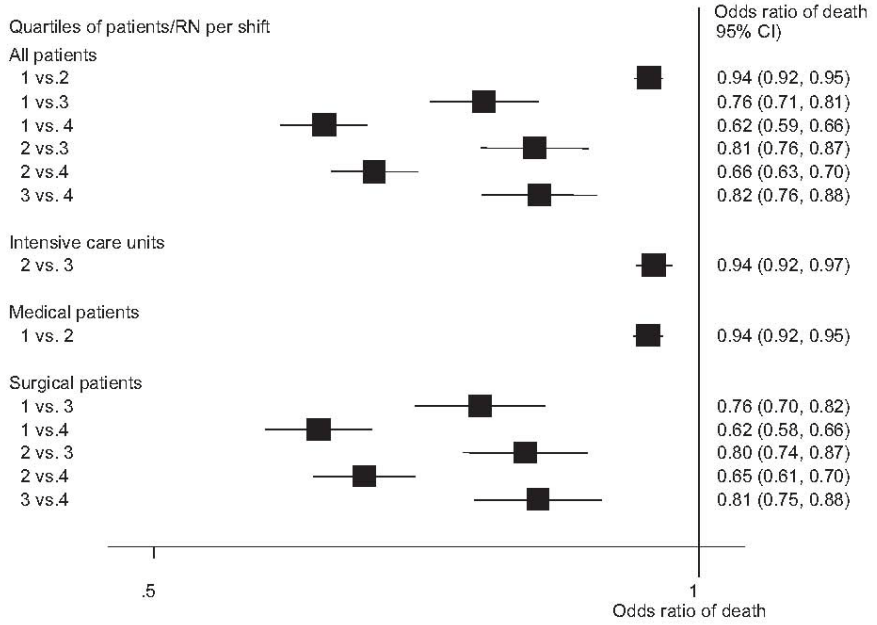
Outcome	Studies	Odds Ratio (95% CI)	No. Avoided Events/1000 Hospitalized (95% CI)
All Patients			
Mortality, intensive care units	5	0.91 (0.86; 0.96)	5 (2; 8)
Mortality, surgical patients	8	0.84 (0.8; 0.89)	6 (4; 8)
Mortality, medical patients	6	0.94 (0.94; 0.95)	5 (4; 5)
Hospital-acquired pneumonia	4	0.81 (0.67; 0.98)	1 (0; 2)
Pulmonary failure	5	0.94 (0.94; 0.94)	1 (1; 1)
Cardiopulmonary resuscitation	5	0.72 (0.62; 0.84)	2 (1; 2)
Intensive care units			
Hospital-acquired pneumonia	3	0.7 (0.56; 0.88)	7 (3; 10)
Pulmonary failure	4	0.4 (0.27; 0.59)	7 (5; 9)
Unplanned extubation	5	0.49 (0.36; 0.67)	6 (4; 8)
Cardiopulmonary resuscitation	3	0.72 (0.62; 0.84)	2 (1; 2)
Surgical Patients			
Failure to rescue	5	0.84 (0.79; 0.9)	26 (17; 35)
Nosocomial bloodstream infection	5	0.64 (0.46; 0.89)	4 (2; 5)

Table was adapted from Kane et al., 2007[7]

Kane RL, Shamliyan TA, Mueller C, et al. The association of registered nurse staffing levels and patient outcomes - Systematic review and meta-analysis. Medical Care. 2007 Dec;45(12):1195-204. Permission granted by Wolters Kluwer Health.

The EPC authors also conducted an indirect analysis of the potential for a "dose-response" relationship. This analysis (Figure 5) assessed the effect across studies of additional RN-level nurses per shift. In each case, comparisons of quartiles of nurse staffing levels showed the expected relationship. In other words, if the association between nurse staffing and mortality is causal, the difference in the risk for death should be greater between the 1st and the 3rd quartile of nurse staffing than it is between the 1st and the 2nd quartile, because the difference in staffing between the 1st and 3rd quartiles is greater than between the 1st and 2nd quartiles.

Figure 5, Chapter 34. Pooled odds ratio of quartiles of nurse staffing levels



Odds ratios are based on pooled analysis consistent across the studies (heterogeneity not significant).

Figure taken from Kane, 2007[7]

Kane RL, Shamliyan TA, Mueller C, et al. The association of registered nurse staffing levels and patient outcomes - Systematic review and meta-analysis. Medical Care. 2007 Dec;45(12):1195-204. Permission granted by Wolters Kluwer Health.

The EPC review concluded that a consistent relationship has been demonstrated but identified numerous limitations in the literature with respect to establishing that this relationship is causal. Ultimately, the authors concluded that the arguments for a causal relationship are "mixed," and they called for future research to address the role of nurse staffing and competence on the effectiveness of patient care, "taking greater cognizance of other relevant factors such as patient and hospital characteristics and quality of medical care."

The Tourangeau search identified literature published through 2009 and was restricted to studies that used hospital-related mortality as the outcome; the authors identified 17 studies (10 of which were not included in the Kane review, seven published since 2007). Although the Tourangeau review was narrative (not a meta-analysis like the EPC review), the two had broadly similar results: 14 of 17 studies found a statistically significant relationship between nurse staffing variables and lower mortality rates (see Evidence Table in Appendix D). In addition, Tourangeau and colleagues identified mixed findings for mortality among five studies assessing the characteristics of the nurse work environment and work relationships, three studies assessing nurses' responses to work and the work environment (e.g., burnout), and seven studies assessing nurses' educational preparation and experience. Only one study assessed any nursing process-of-care variables; it found a cross-sectional relationship between the use of care maps and lower hospital-associated mortality, with an estimated effect size of 10 fewer deaths per 1000 acute medicine discharged patients. Like the EPC review, the review by Tourangeau concluded that a strong relationship exists but that more research is needed to understand the reasons that this relationship between higher nurse staffing and lower hospital mortality might be causal; that is, they called for a theoretical model that explains the relationship in ways that can be tested and refined.

Thus, these two reviews came to broadly similar conclusions: Mostly cross-sectional studies consistently report that higher RN staffing is associated with lower hospital-related mortality. However, as Kane and colleagues ask, "does this association reflect a causal relationship?" If it does not, then an intervention that simply hires more RN-level nurses may not achieve the desired result. Indeed, mandates for fixed nurse-patient ratios have been critiqued as being "an inflexible solution which is unlikely to lead to optimal use of resources…".[9]

Any number of factors might confound the observed relationship: In cross-sectional studies, hospitals that are "better" in a variety of other ways might also be better staffed with RN-level nurses. For example, one published study of electronic health record (EHR) implementation showed that hospitals with EHRs have higher nurse staffing ratios and lower patient mortality.[10]

Longitudinal studies overcome these kinds of limitations in cross-sectional studies, but imprecision in the measures of nurse staffing and of the severity of patient illness (which may increase the risk of death via other, non-nursing-sensitive ways) constitute potential threats to the validity of the association between nurse staffing and mortality.

Update Review

To supplement the two existing reviews, we used the Web of Science to conduct an update search for articles published from 2009 onwards that cited any of four landmark articles in this field. Our update search identified 546 titles, and 4 articles came from reference mining. From 550 titles, we identified 9 longitudinal studies and 1 new systematic review.[11-20] The systematic review included studies that assessed nurse staffing ratios and outcomes restricted to adult ICU settings[20] and reached conclusions similar to the previous reviews: a consistent relationship between increased nurse staffing and better patient outcomes in observational studies, evidence

that falls short of causality. One longitudinal study narratively reported that increased nurse staffing was related to "significantly ($P \leq 0.01$) decreased rates of decubiti, pneumonia, and sepsis," but data were not presented.[14]

We discuss the 1 cross-sectional study because it addresses the effect of an "intervention" to change nurse staffing ratios, implemented in response to a 2004 California law requiring minimum nurse–patient ratios in acute care hospitals.[21] This legislation mandated patient–nurse staffing levels of 5:1, 4:1, and 2:1 for medical or surgical units, pediatric units, and ICUs, respectively. The California legislative mandate does not require nurse staffing to be met with RNs (that is, licensed vocational [practical] nurses can also meet the mandate).

Aiken and colleagues[21] assessed the relationship between nurse staffing and mortality in 2006, 2 years after the California mandate, comparing data from California with those of two states without mandates— New Jersey and Pennsylvania. Data about workloads were drawn from a survey of RNs in the three states—22,336 nurses in total—with a response rate of 35.4 percent. Hospital data came from the American Hospital Association, and patient and outcome data came from State hospital discharge databases.

The authors reported that their survey data showed substantial compliance with the California mandate, with 88 percent of medical/surgical, 85 percent of pediatric, and 85 percent of ICU nurses reporting that on their last shift they were within the mandated staffing ratios. This level of compliance is higher (sometimes considerably) than the values of 19 percent, 52 percent, and 63 percent for the same settings in New Jersey and 33 percent, 66 percent, and 71 percent in Pennsylvania. In logistic regression analyses adjusted for a large number of patient characteristics and three hospital characteristics (bed size, teaching status, and technology use), Aiken and colleagues found statistically significant relationships between the estimation of the average number of patients per nurse and two outcomes: 30-day mortality and failure to rescue (Table 2).

Table 2, Chapter 34. Odds ratios indicating the effect of nurse staffing on 30-day inpatient mortality and failure to rescue, in California, New Jersey, and Pennsylvania

State Hospital Sample	Odds Ratios Estimating the Effect of Nurse Staffing on	
	30-day Inpatient Mortality	Failure to Rescue
California	1.13	1.15
	(1.07-1.20)	(1.09-1.21)
New Jersey	1.10	1.10
	(1.01-1.22)	(1.01-1.21)
Pennsylvania	1.06	1.06
	(1.00-1.12)	(1.00-1.12)

Adjusted odds ratios are based on multivariate robust logistic regression models that controlled for 132 patient characteristics, including age, sex, admission type, dummy variables for comorbidities and type of surgery, and interaction terms, and three hospital characteristics, bed size, teaching status, and technology.

Table was adapted from Aiken et al., 2010.[21]

These associations were found for all three states. The authors also provided several measures of nurse-assessed practice environment characteristics taken from their survey responses, such as "a reasonable workload" and "enough staff to get work done;" all consistently favored California over New Jersey or Pennsylvania. The authors concluded that, 2 years after the California mandate, nurse patient care loads were significantly lower in California than in either New Jersey or Pennsylvania; on average, these loads were one patient fewer, and in the

medical/surgical units they were closer to two patients fewer. California nurses were also more likely to report favorable practice environment characteristics.

Although the study by Aiken and colleagues[21] collected data after the implementation of California's staffing mandate, it did not test the effect of that mandate per se because it had no comparison data from the period before the mandate went into effect. The possibility that the relationship is causal is blunted by a longitudinal study that examined measures from before and after the California mandate and showed the expected changes in nurse staffing and proportion of licensed staff per patient but no improvement in two patient outcomes believed to be nursing-sensitive: falls and pressure ulcers.[11,13] In fact an unexpected statistically significant increase in pressure ulcers was associated with a greater number of hours of care for the patient (which may have been due to greater detection). This study did not assess mortality.

Five additional longitudinal studies add further information to this picture. The first is a longitudinal assessment of nurse staffing and hospital mortality and failure to rescue in 283 California hospitals between 1996 and 2001, which had access to direct measures of nurse staffing.[15] In multivariable models that included numerous hospital market characteristics as well as risk adjustment using the Medstat Disease Staging Methodology to produce a predicted probability for complications or death, the authors found that an increase of one RN FTE per 1,000 inpatient days was associated with a statistically significant 4.3 percent decrease in mortality.

The second longitudinal study assessed care at 39 Michigan hospitals between 2003 and 2006; it included adults admitted through the emergency department with acute myocardial infarction, heart failure, stroke, pneumonia, hip fracture, or gastrointestinal bleeding.[17] This study simultaneously controlled for high hospital occupancy on admission, a weekend admission, seasonal influenza, and nurse staffing levels. Each factor had a statistically significant increased effect on in-hospital mortality. Each additional RN FTE per patient day was associated with a 0.25 percent decrease in mortality.

The third longitudinal study assessed the effect of a mandate in three Western Australia public hospitals to implement a new staffing method, the Nursing Hours Per Patient Day (NHPPD).[18] The study assessed three time periods: 20 months before implementation 7 months of a "transition period," and 2 months post implementation. The authors found that the total nursing hours and RN nurse hours increased during the observation period. However, the percentage of total nursing hours provided by RNs decreased (from 87% to 84%). Also, the article stated that "although the nursing hours increased for all three hospitals (in the post-implementation period), the changes were not statistically significant," Mortality rates improved during this time period. Among a host of other outcomes, some improved, others did not, and some changes were inconsistent across hospitals. Although the study was described as an interrupted time series, it was analyzed as a before-and-after study.

The fourth longitudinal study assessed changes in nurse staffing over 9 years in 124 Florida hospitals and related these to changes in Agency for Healthcare Research and Quality Patient Safety Indicators.[19] The study used both initial staffing ratios and changes in staffing ratios. Results were mixed but generally favored better patient safety outcomes with higher RN staffing levels.

The methodologically strongest longitudinal study is discussed here in more detail.[16] In this study, Needleman and colleagues used data over time from a single hospital to assess the association between naturally occurring differences in levels of RN staffing within the same hospital and inpatient mortality. This study is further characterized by a careful matching of

nurse staffing on a shift-by-shift basis with the actual patients cared for during that shift. Knowing the actual patients cared for allowed for more sophisticated adjustments at the patient level of risk-of-death. The study was carried out at a tertiary academic hospital between 2003 and 2006 and included 197,691 admissions and 176,696 nursing shifts, across 43 hospital units. The patients themselves averaged 60 years of age, and about 50 percent were covered under Medicare. The variable of interest was exposure of the patient to nursing care that was below the target level (for that type of unit) for that shift, in other words the proportion of shifts below target level staffing, on a patient basis. An additional exposure variable was a "high turnover" shift (in other words, a shift with many admissions, discharges, or transfers). The authors found that exposure to each shift of below-target staffing or high turnover was associated with a 2 to 7 percent increase in mortality, with higher levels of risk if the high-turnover or below-target shift occurred in the first 5 days after admission (see Table 3). For patients who were not in an ICU, this increased risk rose to 12 percent or 15 percent.

Table 3, Chapter 34. Risk of death associated with exposure to a shift with an actual RN staffing level 8 hours or more below target, high patient turnover, and other variables

Variable	Hazard Ratio (95% CI)
Total of 197,961 patients	
Each shift with RN staffing level below target or high turnover during first 30 days after admission	
Shift with RN staffing level 8 hr or more below target	1.02 (1.01-1.03)
Shift with high patient turnover	1.04 (1.02-1.06)
Each shift with RN staffing level below target or high turnover during first 5 days after admission	
Shift with RN staffing level 8 hr or more below target	1.03 (1.02-1.05)
Shift with high patient turnover	1.07 (1.03-1.10)
Total of 171,041 patients with no shifts in an ICU	
Each shift with RN staffing level below target or high turnover during first 30 days after admission	
Shift with RN staffing level 8 hr or more below target	1.04 (1.03-1.06)
Shift with high patient turnover	1.07 (1.02-1.13)
Each shift with RN staffing level below target or high turnover during first 5 days after admission	
Shift with high patient turnover	1.15 (1.07-1.24)

Table adapted from Needleman et al., 2011[16]

Needleman J, Buerhaus P, Pankratz VS, et al. Nurse Staffing and Inpatient Hospital Mortality. New England Journal of Medicine. 2011 Mar;364(11):1037-45. Permission granted by Massachusetts Medical Society (MMS) publishers of the New England Journal of Medicine.

The data from Needleman and colleagues contribute to the "causality" determination because the study is longitudinal within one hospital, thus controlling for the "hospital effect" potentially present in all cross-sectional studies, and has detailed measures of exposure and confounding variables. These results, and the dose-response analysis from the EPC review, are the two strongest pieces of evidence in support of causality.

What Are the Harms of the Patient Safety Practice?

One finding of the survey administered by the Aiken study, which collected data 2 years after the California mandate for minimum nurse staffing ratios,[21] was that some California nurses perceived less support from the use of LVNs, unlicensed personnel, and non-nursing support services (housekeeping, unit clerks) following implementation of the mandate. For example, 25 percent of RNs responded that they perceived decreased use of LVNs following the mandate, whereas 10 percent perceived increased use and 56 percent reported that use remained the same.

The longitudinal assessments from California[11] and Western Australia[18] reported an increase in pressure ulcers associated with increased nurse staffing, although this development may reflect increased detection. Almost no other studies mentioned an explicit assessment of potential unexpected adverse outcomes.

How Has the Patient Safety Practice Been Implemented, and in What Contexts?

Because we found no published studies of an assessment of an "implementation" per se, we cannot answer this question directly. However, the cross- sectional and longitudinal studies that have been published, and that have consistently shown an association between staffing levels and patient outcomes, have included a broad array of hospitals, often all or almost all hospitals (except for very small ones) in a state. Therefore, if the relationship between increased RN staffing and inpatient mortality is a causal one, it very likely is applicable to most hospitals and most contexts. This PSP is most likely to be carried out due to State or Federal policy.

Are There Any Data About Costs?

Four simulation studies reported information about costs. The first used 2003 data from 28 Belgian cardiac surgery centers to assess the costs and outcomes of increasing nurse staffing. Assuming a causal relationship between this staffing increase and an outcome of 5 fewer patient deaths per 1000 elective hospitalizations, the authors concluded that the incremental cost-effectiveness ratio was 26 372 Euros (approximately $35 000) per avoided death and 2639 Euros (approximately $3500) per life-year gained.[22]

The second simulation study was conducted by the University of Minnesota Evidence-based Practice Center, which produced the systematic review on nurse staffing.[23] It used its own meta-analysis as the basis for estimating the potential monetary benefits of increased RN staffing. Assuming that those relationships were causal and taking a societal perspective, the authors concluded that increasing RN staffing by 1 FTE per patient day was related to positive savings–cost ratios across a broad range of clinical settings. For example, the net cost of adding 1 RN FTE per 1000 hospitalized ICU patients was an estimated $590 000, whereas the net benefit (in terms of life-years saved and productivity) was an estimated $1.5 million, for a benefit–cost ratio of 2.51. However, hospitals did not save money because the net cost of adding an extra nurse FTE was not offset by the expected 24% decrease in length of stay.

A third simulation study used data from studies by Aiken and colleagues and Needleman and colleagues to estimate benefits in mortality and length of stay, respectively, and estimated an incremental cost-effectiveness ratio between $25 000 and $136 000 per life saved as patient–RN staffing ratios decreased from 8:1 to 4:1. The model was most sensitive to the estimate of effect on mortality.[24]

Lastly, one additional study from Portugal estimated that increasing neonatal nurse staffing to "adequate" would increase staff costs more than 30% of the current rate.[25]

Are There Any Data About the Effect of Context on Effectiveness?

As previously noted, the association between staffing and mortality that underpins this PSP has been observed in a wide variety of hospitals and contexts. We believe that the effect, if it is causal, is likely to be relatively insensitive to the usual effects of contexts considered in this review. Of note, the recent study by Needleman and colleagues was conducted in a tertiary

medical center that has a lower-than-expected in-hospital mortality rate and a reputation for excellence. Therefore, the association between increased RN staffing and lower mortality, if it is causal, is potentially applicable even to high-performing hospitals.

Conclusions and Comment

Nurse staffing ratios have a consistent association with reductions in hospital-related mortality. However, the strength of evidence for causality in this finding cannot be rated high, given the lack of evaluations of a deliberate change in RN staffing from some initial value (for example, 6 patients to 1 RN on general medical wards) to some higher RN staffing value (such as 5-to-1 or 4-to-1). Such an evaluation should be possible, either as a time series analysis or as a controlled before-and-after analysis. Studies evaluating a deliberate change in nurse staffing ratios would greatly improve our understanding of the likelihood of causality. Developing a testable conceptual framework for how increased staffing can influence outcomes would be an important addition to these and other studies.

Therefore, given the consistent associations observed in multiple cross-sectional and a few longitudinal studies, the indirect "dose-response" analysis by Kane and colleagues, and the methodologically careful single-site study by Needleman and colleagues, we grade the strength of evidence for increased RN staffing and lower hospital-related mortality as moderate. The strength of evidence for other outcomes (hospital-acquired pneumonia, failure-to-rescue, falls, pressure ulcers, etc.) remains low, owing to the sparseness of data, conflicting data, and/or lack of evidence of a dose-response relationship.

If the relationship between nurse staffing and mortality outcomes is causal, then the wide variety of hospital settings included in existing analyses suggests that the effect is likely to be relatively insensitive to hospital contexts. However, some of the nurse work environment factors, such as job satisfaction, burnout, teamwork, workload, and leadership, are potentially important effect modifiers, and this area merits further study. Summary tables are located below (Tables 4 and 5).

Table 4, Chapter 34. Summary table for increasing nurse-to-patient staffing ratios to prevent death

Scope of the Problem Targeted by the PSP (Frequency/Severity)	Strength of Evidence for Effectiveness of the PSPs	Evidence or Potential for Harmful Unintended Consequences	Estimate of Cost	Implementation Issues: How Much do We Know?/How Hard Is it?
Common/High	Moderate	Low	High	A lot/Not difficult

Table 5, Chapter 34. Summary table for increasing nurse-to-patient staffing ratios to prevent falls, pressure ulcers, and other nursing sensitive outcomes (other than mortality)

Scope of the Problem Targeted by the PSP (Frequency/Severity)	Strength of Evidence for Effectiveness of the PSPs	Evidence or Potential for Harmful Unintended Consequences	Estimate of Cost	Implementation Issues: How Much do We Know?/How Hard Is it?
Common/High	Low	Low	High	A lot/Not difficult

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